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ABSTRACT

This is the third in a series of four guidebooks on minimum course content designed to develop geometric concepts intuitively, using the "slides, flips, and turns" approach developed by the University of Illinois, Committee on School Mathematics. Topics include the development of the concept of symmetry, triangles and quadrilateral classifications, parallel and perpendicular lines and work with directed numbers. Overall course goals are specified; a course outline, performance objectives and suggested teaching strategies are listed. A pretest and a posttest are also included. (JP)

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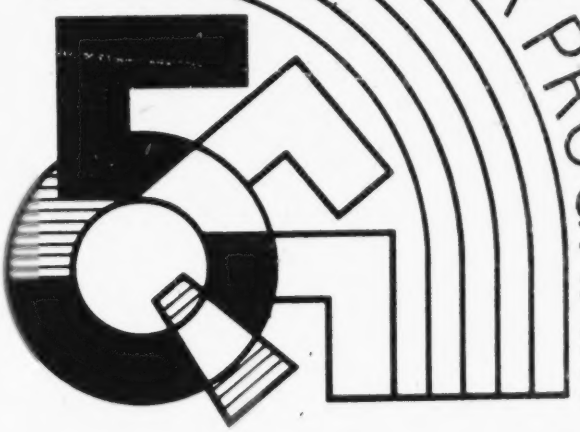

SFT SYMMETRY

5212.48, 5213.48

MATHEMATICS

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

SE 017 199

ED 086538

QUINMESTER MATHEMATICS

COURSE OF STUDY

FOR

SFT SYMMETRY

5212.48
5213.48

(EXPERIMENTAL)

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida 33132
1971-72

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PREFACE

The following course of study has been designed to set a minimum standard for student performance after exposure to the material described and to specify sources which can be the basis for the planning of daily activities by the teacher.

The course sequence is suggested as a guide; an individual teacher should feel free to rearrange the sequence whenever other alternatives seem more desirable. Since the course content represents a minimum, a teacher should feel free to add to the content specified.

Any comments and/or suggestions which will help to improve the existing curriculum will be appreciated. Please direct your remarks to the Consultant for Mathematics.

All courses of study have been edited by a subcommittee of the Mathematics Advisory Committee.

CATALOG DESCRIPTION

The third of four quins designed to develop geometric concepts intuitively, using the "slides, flips, and turns" approach developed by the University of Illinois Committee on School Mathematics. Includes the development of the concept of symmetry, triangle and quadrilateral classifications, parallel and perpendicular lines, and work with directed numbers.

Designed for the student who has successfully completed SFT Congruence, 5212.47; 5213.47.

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GOALS

1. To correlate traditional geometric language with the motion geometry techniques and language developed in 5212.46; 5213.46 and 5212.47; 5213.47.

2. To give the student positive, success-oriented experiences in mathematics, increase his motivation, and develop an experimental attitude.

3. To introduce the set of integers.

4. To increase the student's communication skills with computational and geometric concepts.

PERFORMANCE OBJECTIVES

The student will be able to:

1. Identify and define: parallel lines, corresponding angles, alternate angles, angle bisector, perpendicular lines, vertical angles and diagonals.

2. Classify triangles (isosceles, equilateral, scalene) and identify their properties.

3. Classify quadrilaterals and identify their properties.

4. Given a figure, identify its lines of symmetry and its turn symmetries.

5. Perform computations with the set of integers.

STRATEGIES - GENERAL COMMENTS

Before beginning this quin, the teacher should read carefully the course description and comments contained in the Teacher's Edition and the Activities Handbook. This discussion provides an excellent and necessary overview of the content of the course.

In addition to this, the following general comments apply:

1. Entering competencies expected are: mastery of the skills and concepts presented in quin 5212.47; 5213.47.

2. The concept of tracings and the resulting isometric mappings is central to the course. The students should attain and preserve skill in tracing figures and should realize that only position changes when a tracing is moved. Onionskin typing paper works very well for tracing and a good supply should be maintained.

3. The course is, in actuality, two courses interwoven: The Motion Geometry materials and the Directed Number Worksheets. The Lesson Maps give a good sequence but you may wish to use a different pattern for your class.

4. It might be helpful to require the students to keep all the directed number worksheets in a separate notebook, thus forming a book on integer operations.

5. The activities found in the Activities Handbook should be used to maintain an experimental tone in the classroom. The frequent and short quizzes help students gain confidence, while reviewing small blocks of material.

6. It is practically impossible to use all of the activities in the Handbook. Plan to use all the Directed Number Worksheets and pick out as many Motion Geometry Activities as are appropriate to your class and the time available.

7. It is recommended that extensive use of the overhead projector be made. Many of the activities use transparencies, and transparencies of important workbook pages should be made to assist with discussion. The ideal demonstration ("proof" for our purposes)'of congruence is to make two transparencies and maneuver one over the other to show that they match exactly. Transparencies of quizes and tests are valuable so the students can either grade each other's papers and/or have immediate feedback and discussion opportunities.

8. Discretion should be used in deciding whether or not to allow books to leave the classroom. It has been found effective to have row leaders distribute and collect books each day, leaving the books in the room. A beginning activity on the board can be used to expand on and review material and to settle the students while the row leaders are distributing the books.

9. The course was designed to be a work-text type program. Much thought and planning should occur if the course is attempted using the texts as non-consumable materials.

10. The following materials will be required for this sequence of quins:

    Overhead projector and screen
    Overhead pens
    Thermofax duplicating masters and acetate film
    Duplicator paper
    Tracing paper (onionskin)
    Graph paper
    Scissors
    Protractors
    Standard foot rulers
    Centimeter rulers
    Coins or discs of different sizes
    Marking pencils
    Yardstick or tape measure
    Magic mirror (provided by publisher with books)
    5x8 cards
    Storage space

TIME SCHEDULE

SYMMETRY

Chapter 1

1-53	Parallels and Perpendiculars	16 days
	1 Quiz 1 Test	

Chapter 2

54-107	Properties of Triangles	17 days
	1 Test	

Chapter 3

108-142	Quadrilaterals	11 days
	1 Test	
		44 days

BOOK 3, CHAPTER 1: PARALLELS AND PERPENDICULARS

TEXT PAGES	TOPIC	OBJECTIVE
1-4	Exploration	a. Given a pair of lines (or parts of lines), the student can tell whether or not they are parallel and, if so, give a slide (by drawing a slide arrow) that maps one line to the other.
5-6	Parallel Lines	
7-8	Exercises	b. The student is able to identify models of parallel lines in his environment.
9	Exploration	Given a pair of parallel lines and a transversal, the student can identify pairs of corresponding angles, and given the measure of one of such a pair, can give the measure of the other without measuring.
10-14	Parallel Lines and Corresponding Angles	
15	Summary	
16	Exploration	Same objective as for pp. 9-15, except for both corresponding and alternate angles.
17-20	Parallel Lines and Alternate Angles	
21-22	Summary	
23-25	Applications	

(BOOK 3, CHAPTER 1: PARALLELS AND PERPENDICULARS) Continued

TEXT PAGES	TOPIC	OBJECTIVE
25-29	Exploration	Given a polygon of up to six sides, the student can give the angle-sum without measuring.
29	Triangle Angle-Sum	
30-31	Polygon Angle-Sum	Given a figure with vertical angles, parallel lines and a transversal, and/or triangles, the student is able to supply missing angle measures without measuring.
32-35	Exploration	a. Given a pair of lines (or parts of lines), the student can tell whether or not they are perpendicular, and give evidence based upon flips, turns, angle measures, etc.
36-37	Perpendicular Lines	
37-39	Exercises	
40-43	Perpendicular Rays and Segments	b. The student is able to identify models of perpendicular lines in his environment.
44	Summary	
45-46	Perpendicular and Parallel Lines	a. The student is able to construct a pair of perpendicular lines by folding.
		b. The student is able to construct a pair of parallel lines by folding.

(BOOK 3, CHAPTER 1: PARALLELS AND PERPENDICULARS) Continued

TEXT PAGES	TOPIC	OBJECTIVE
47-50	Review Exercises	Check on the above objectives.
51-52	Test	Evaluation.
53	Extra for Experts	Supplementary.

BOOK 3, CHAPTER 2: PROPERTIES OF TRIANGLES

TEXT PAGES	TOPIC	OBJECTIVE
54-55	Exploration	a. Given a figure, the student is able to identify its lines of symmetry and to use a Magic Mirror to construct them.
56-59	Lines of Symmetry	
60	The Magic Mirror	
61-64	Exercises	b. Given part of a figure and a line, the student is able to use the Magic Mirror to complete the figure so that it is symmetric with respect to the line.
65	Symmetry of Segments	Given a segment, the student is able to identify and sketch all of its lines of symmetry.
65-66	Exercises	
67-69	Angle Bisector	a. Given an angle, the student is able to construct its angle bisector by folding, and by using the Magic Mirror.
		b. Given the measure of an angle, the student is able to compute the measure of each angle formed by the bisector of the given angle.
69-71	Exploration	a. Given a triangle, the student is able to:
72	Line Symmetries for Triangles	i. identify all of its line symmetries.
73-76	Exercises	ii. classify the triangle as a scalene, isosceles, or equilateral triangle.
77-79	Line-Symmetric Triangles	

(BOOK 3, CHAPTER 2: PROPERTIES OF TRIANGLES) Continued

TEXT PAGES	TOPIC	OBJECTIVE
80	Isosceles Triangles	iii. list corresponding parts under each of the line symmetries. iv. supply missing side or angle measures based on the symmetries. b. Given a description of a triangle in terms of symmetry, congruent sides, or congruent angles, the student is able to identify it and tell at least one other property that triangles must have.
81-82	Exercises	
83-85	Congruent Angles of a Line-Symmetric Triangle	
86	Congruent Angles for Isosceles Triangles	
86-87	Exercises	
88	Exploration	
89	Equilateral and Equiangular Triangles	
89-92	Exercises	
93-94	Exploration	a. Same objectives as for pp. 69-92, except we now include all variations of scalene, isosceles, equilateral, and/or right triangles. b. Given a triangle the student is able to draw a segment to divide it into two right triangles. c. Given a description of a triangle in terms of symmetry, side, or angle properties, the student is able to draw such a triangle.
95	Right Triangles	
95-100	Exercises	

(BOOK 3, CHAPTER 2: PROPERTIES OF TRIANGLES) Continued

TEXT PAGES	TOPIC	OBJECTIVE
101-104	Review Exercises	Check on above objectives.
105-106	Test	Evaluation.
107	Extra for Experts	Supplementary.

BOOK 3, CHAPTER 3: QUADRILATERALS

TEXT PAGES	TOPIC	OBJECTIVE
108-113	Exploration	Given a quadrilateral, the student is able to identify and name its vertices, sides, angles, and diagonals.
114	Angles of a Quadrilateral	
115	Naming Quadrilaterals	
116	Exercises	
117-119	Types of Line Symmetry	a. Given a quadrilateral, the student is able to identify all of its lines of symmetry, and tell whether each is a diagonal or nondiagonal symmetry.
120-123	One Diagonal Symmetry Line	
124-127	One Nondiagonal Symmetry Line	b. Given a quadrilateral with a nondiagonal symmetry line, the student is able to demonstrate knowledge of other properties the figure must have by supplying missing measures, and/or identifying parallel, or congruent parts.
128-129	Summary	
130-131	Trapezoids	c. The student is able to identify those quadrilaterals that are trapezoids or isosceles trapezoids and tell what properties each must have.

(BOOK 3, CHAPTER 3: QUADRILATERALS) Continued

TEXT PAGES	TOPIC	OBJECTIVE
		d. Given a description of a trapezoid or isosceles trapezoid in terms of symmetry, side, diagonal, or angle properties, the student is able to identify it and give at least one other property of that figure.
132-134	Exploration	Same objectives as for pp. 117-131, but for parallelograms and for 180° turn symmetries.
134-137	Turn Symmetric Quadrilaterals	
138	Parallelograms	
138-142	Exercises	

PRETEST

Use the posttest for Congruence 5212.47; 5213.47 as the pretest for this quin.

POSTTEST

Use the Test for Book 3, T29 - T32 (teacher's edition) as the posttest for this quin.

SUGGESTED SOURCES OF ENRICHMENT AND PRACTICE ACTIVITIES

A. State adopted

1. Crouch, William H. Coordinated Cross Number Puzzles A, B, C. New York: McCormick-Mathers Publishing Co., 1970.

2. Denholm, R. A. and Blank, V. D. Mathematics Structure and Skills 1st Book. Chicago: Science Research Associates, 1968.

3. Foley, Jack; Jacobs, Wayne and Basten, Elizabeth. Individualizing Mathematics. Menlo Park, California: Addison Wesley Publishing Co., 1970.

   Skills and Patterns

   Whole Numbers
   Numbers - Patterns - Theory
   Sets
   Fractions -- Addition and Substraction
   Fractions -- Multiplication and and Division
   Decimals -- Meanings and Operations

4. Johnson, D. A., et al. Activities in Mathematics: First Course: Number Patterns. Glenview, Illinois: Scott, Foresman and Co., 1971.

5. Sobel, Max A., et al. Essentials of Mathematics Series: Book 1. Boston: Ginn and Company, 1970.

6. Tucker and Wheeler. Mathematics Laboratory. New York: McCormick-Mathers Publishing Co., 1970.

7. Wirtz, Robert W., et al. Math Workshop Levels C, D, E. Chicago: Encyclopedia Britannica Educational Corp., 1964.

B. Non-state adopted

1. Brandes, Louis G. Yes, Math Can Be Fun. Portland, Maine: J. Weston Walch, 1960.

2. Dumas, Enoch. Arithmetic Games. Palo Alto, California: Fearon Publishers, Inc., 1960.

3. _____. A Collection of Cross Number Puzzles.

4. Larsen, Harold D. Games to Play.

5. _____. Guzintas.

6. _____. Ways to Multiply.

7. _____. Brain Teasers.

Evanston, Illinois: Harper and Row, Publishers, 1961.

8. Meyer, Jerome S. Arithmetricks. Englewood Cliffs, N. J.: Scholastic Magazine, 1965.

9. Wagner, Guy, et al. Arithmetic Games and Activities. Darien, Connecticut, 1964.